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ABSTRACT

Differences in social-psychological environments between parochial and public schools, and between mathematics and English courses, were investigated involving 317 grade 10 boys and girls. Multivariate and univariate analysis of variance produced significant main effects and School x Subject interaction. Differential validities of environment variables in predicting achievement using multiple regression suggested that perception of learning environment in a subject substantially predicts achievement in that subject. Incremental validity of learning environment in the context of IQ with achievement is also substantial. Implications for instructional effectiveness and school organization are discussed. (Author/GK)

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Social-Psychological Environments and Cognitive Achievement[1,2]

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Abstract

Differences in social-psychological environments between parochial and public schools, and between Mathematics and English courses, were investigated involving 317 grade 10 boys and girls. Multivariate and univariate ANOVA produced significant main effects and School x Subject interaction. Differential validities of environment variables in predicting achievement using multiple regression suggested that perception of learning environment in a subject generally predicts achievement in that subject substantially. Incremental validity of learning environment in the context of IQ with achievement is also substantial. Implications for instructional effectiveness and school organization are discussed.

Social-Psychological Environments and Cognitive Achievement

The reviews of psycho-social learning environments (Randhawa & Fu, 1973; Shulman & Tamier, 1973; Walberg, 1974, 1979; Moos, 1979) have discussed theoretical, methodological, and practical issues and concluded that perceptions of learning environments are useful as independent, mediating, and dependent variables in educational investigations in natural settings. A number of studies reported in these reviews demonstrate clearly that social-psychological perceptual scales such as the Learning Environment Inventory (LEI) provide statistically reliable sensitivity to educational treatments such as school organization, academic subjects, and instructional innovations.

A number of studies (see Walberg, 1974, 1976; Moos, 1979) have shown that the LEI variables are sensitive to curriculum intervention and various dimensions of school organization. However, the sensitivity of the LEI variables in schools organized on parochical and secular dimension, though expected, has not been demonstrated. Cognitive-developmental theory (see Kohlberg, 1969) suggests that role-taking opportunities and social participation affect the level of moral reasoning of individuals. From the social-psychological perspective of the theory that underlies the development of the LEI, it can be assumed that the learning environments in the schools organized on the parochical versus secular dimension will be different. Schools that are organized by religious groups exercise moral and ethical values throughout the teaching of the curriculum as well as in classes specifically designed for religious studies. Whilst, on the other hand, the secular schools are organized in such a way that moral and ethical aspects are dealt with indirectly and no provision is made for religious instruction in these schools. The present study investigates whether the parochial versus the secular dimension of school organization and academic subjects are

significant determinants of the LEI variables. Another objective of the present investigation is to determine whether the LEI variables are differentially effective in predicting cognitive achievement, that is, whether the multiple correlation of the LEI scales with achievement in the subject for which the perception of LEI measures are obtained is greater than the multiple correlation of achievement in that subject with the perception of learning environment in another subject.

Method

Sample

The subjects were grade 10 students from three high schools in a small Canadian city. There were three grade 10 classrooms in each of the boys' and girls' parochical schools in this city. The coeducational secular high school had eight grade 10 classrooms. In order to approximately match the number of secular-parochial classrooms, six of the eight classrooms from the secular high school were randomly selected to participate in the study. From the girls' parochial school, 36 and 35 students completed the LEI to reflect their perception of the learning environment in Mathematics and English respectively. Similarly, from the boys' parochical school, 40 students each completed the LEI with regard to Mathematics and English respectively and from the coeducational secular high school, 40 girls and 41 boys completed the LEI with regard to Mathematics, and 41 girls and 44 boys completed it with regard to English.

Procedures

The selected subjects were given the Otis-Lennon Mental Ability Test (Form J), the Sequential Tests of Educational Progress (STEP) in Reading, Mechanics of Writing, English Expression, Math Computation, and Math Basic

Concepts, and the LEI (Anderson, 1971) consisting of 105 Likert-type rating items. The 15 scales of the LEI are identified as cohesiveness, diversity, formality, speed, environment, friction, growth direction, favoritism, difficulty, apathy, democratic, cliqueness, satisfaction, disorganization, and competitiveness. Reliability and validity data for the LEI scales are provided in Anderson (1971b). For the purposes of the present study, the Otis-Lennon raw scores were converted into the corresponding deviation IQ. The STEP and LEI raw scores were used for the analysis of the data.

Design

The design was a 3 x 2 x 2 incomplete block factorial consisting of three levels of school (parochical girls, parochial boys and secular coeducational), two levels of subject (Math and English), and two levels of sex. The data were also analyzed in two separate 2 x 2 complete blocks consisting of two levels of school and two levels of subject. The multiple regression analysis with cognitive variables as dependent and the 15 LEI scores and the DIQ as predictor variables was also carried out for each of the two levels of the independent variable, subject (Math and English). Another set of multiple regression analyses was carried out in which the DIQ variable was not used.

Analysis and Results

A multivariate and univariate analysis of variance was performed on the 15 LEI scales as dependent variables in an incomplete block 3 x 2 x 2 and two complete blocks 2 x 2 designs as explained above. The critical value of alpha was set at .05.

Three-way ANOVA Results

The observed means for the three-way ANOVA main effects on the LEI scales

are given in Table 1. The multivariate test of equality of mean vectors for

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Insert Table 1 about here.
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the school main effect was significant [$F(30,592)=4.73$, $p<.0001$]. The univariate F-ratios on cohesiveness, environment, friction, goal direction, favoritism, cliqueness, apathy, democratic, and competitiveness were also significant. It is evident from this school main effect that the learning environments in the three schools were different, but specific differences in learning environments between pairs of schools are not possible to determine in the usual way. Therefore, the multivariate and the univariate analysis of variance was done by partitioning the sum of squares into individual contrasts. The only two comparisons of interest were the comparison of each of the parochical schools with that of the coed. secular school. It was found that the learning environment of the girls' parochical school was significantly different from that of the coeducational secular school [$F(15,296)=7.00$, $p<.0001$]. The univariate ANOVA indicated for this simple contrast that the learning environment of the girls' parochical school and the coed. secular school was different, with the mean of the parochical girls' school significantly higher on cohesiveness and cliqueness, whereas the coed. secular school had significantly higher means on the environment, apathy, democratic, and competitiveness scales of the LEI. Similarly, the boys' parochical and the coed. secular school had significantly different learning environments [$F(15,296)=4.58$, $p<.0001$] such that the boys' parochial school had significantly higher means on cohesiveness, friction, favoritism, and competitiveness, whereas the coeducational secular school had higher means on the goal direction and democratic scales.

The subject multivariate main effect was significant [$F(15,296)=7.23$, $p<.0001$] with univariate significant F-ratios ($p<.05$) on diversity, speed, environment, friction, cliqueness and difficulty. The specific differences in the two subjects

were such that Math was perceived to be higher on speed and difficulty than English whereas English was perceived to be higher on diversity, environment, friction and cliqueness than Math.

The learning environments perceived by the boys and girls were significantly different [$F(15,296)=2.10$, $p<.01$]. The univariate differences in the perception of the learning environments of boys and girls were such that girls perceived the learning environments to be less diverse and more competitive than the boys.

Two-way ANOVA of the Female Data

The overall learning environment perceived by girls of the parochical and the coeducational secular school was different [$F(15,134)=6.41$, $p<.0001$]. The specific differences in the learning environment as perceived by the girls of the parochical and the coeducational secular school were such that significantly higher means on cohesiveness, favoritism, and cliqueness were obtained for the parochial school whereas the girls of the coeducational school obtained significantly higher means on the diversity, environment, apathy and democratic scales (see Table 2). The perceptions of the girls with regard to the learning environ-

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Insert Table 2 about here.
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ment in the two academic subjects were significantly different [$F(15,134)=5.45$, $p<.0001$]. Univariate specific differences were obtained in Math which gave higher means on speed and difficulty whereas English gave higher means on diversity, environment, friction and cliqueness. The above differences between the schools and the subjects must be qualified because of a significant School x Subject interaction [$F(15,134)=2.06$, $p<.0154$]. In the univariate ANOVA, this interaction was significant on the speed and difficulty scales. The differences on speed and difficulty between the girls of the two schools were such that girls in the parochial school perceived their learning environment in Math less speeded and difficult than the girls in the coeducational secular school. However, the

girls in the two schools perceived their learning environment to be similar in English. Hence, it seems that subject specific differences in the learning environment on speed and difficulty scales were primarily due to the perceived differences in the learning environment in Math.

Two-way ANOVA of the Male Data

The multivariate school main effect was significant [$F(15,147)=3.29$, p .0001]. The univariate significant differences on the LEI variables were such that the boys of the parochical school had significantly higher means on cohesiveness, friction, favoritism, disorganization, and competitivensss and smaller means on goal direction, and democratic skills than the boys of the coeducational secular school (see Table 2). The multivariate subject main effect was significant [$F(15,147)=2.88$, $p<.0006$] and the significant univariate results indicated that on Math the means on speed and difficulty were higher and on friction lower than on English. The multivariate School x Subject interaction was significant [$F(14,147)=3.80$, $p<.0001$]. A corresponding significant univariate interaction was obtained on speed and difficulty much like that obtained for the female data and that the boys of the parochial school also found Mathematics less speeded and difficult than the boys of the coeducational secular school.

Multiple Regression

The results of the stepwise multiple regression for each of the STEP subtests as criterion variables and the 15 LEI scales and the Otis-Lennon Deviation IQ as the predictor variables are reported in Table 3. As mentioned earlier in the design section and shown in this table, this regression analysis was done

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Insert Table 3 about here.

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by 1) entering IQ as the first variable and, 2) excluding this particular variable from the regression of achievement with the LEI scores of students in Math and English courses respectively. The purpose of this regression analysis

was to determine whether the LEI scales would predict differentially higher variance of the criterion subtests corresponding to the subject in which it was administered as opposed to the subtests corresponding to the specific subject in which it was not administered. One must keep in mind, however, that the academic achievement subtests have substantially high correlation with one another and with IQ. Due to this artifact, the sensitivity of the LEI scales are not easily discernible by examining the columns of multiple R's in which the effect of IQ was not partialled out. However, when the IQ was partialled out first, the LEI show generally higher multiple R's with language related subtests for students of English than for students of Math. The R's in Math subtests do not show this pattern for students in the two subjects.

Discussion

Patterns of learning environment variables found in different types of schools are relevant to theoretical issues in developmental psychology, since they permit the theoretical postulate that students undergoing these various "educational treatments' have different socialization experiences and different outcomes as a consequence of this socialization. The study of multidimensional learning environments make it possible to assess, as in the present study, how specific aspects of schools and content relate to a variety of these variables (Moos, 1979). For example, both the boys' and the girls' parochial schools have been found to provide more cohesive learning environments than the coed. secular school. The cohesiveness scale of the LEI, previously called intimacy, provides a measure of the feelings of closeness and togetherness (Anderson, 1971b) and is found to be related to the size of classes and may be inferred to relate, in this case, to the size of the parochial schools. In any case, these parochial schools have been found to be lower than the coed. secular school on the democratic scale. However, it is felt that this property has been overrated in the past and that the democratic scale does not relate significantly to pupil learning (Anderson, 1971b).

The parochial girls' school was found to be higher on the cliqueness and lower on environment, apathy and competitiveness scales. By mapping out the normative properties of socialization settings, viz. schools, in terms of the LEI scales, a social-ecological perspective on adolescent development can be provided. The normative properties of groups would include such pressures as those to dress, act, and think in certain ways, expectations about the nature of interpersonal relationships, and the valued and non-valued goals of various groups (Moos, 1979). In terms of the differences in the two types of schools, such differential normative adolescent characteristics would be expected to emerge. Similarly, specific LEI scale differences in the boys' parochial and the coed. secular schools can be explained in terms of social-ecological persepctives.

The content specific differences in the learning environments of Math and English students in the present study are generally consistent with the findings of several previous investigations (Anderson, Walberg, & Welch, 1969; Anderson, 1971a). In the present study, the students in Math courses found it to be more difficult and paced than the students in English courses, whereas the English courses were found to provide a higher degree of diversity, better physical and material resources, more friction and cliqueness than the Math courses. A large scale study (Randhawa & Michayluk, 1975) did not find overall differences in grade 8 and 11 classes of Math, English, Social Studies and Science. The fact is that in the present study data of individual students were used whereas in the Randhawa and Michayluk study data from classes were used in the analysis. This difference in the two studies may explain, in part, why results are not consistent. It must be kept in mind though that Anderson (1971a) and Anderson, Walberg, and Welch (1969), in spite of their data collection similarity with Randhawa and Michayluk (1975), had obtained course content differences in the LEI scales.

Students in English classes viewed them in a manner consistent with the stereotype of their being slow-paced and easy as compared to classes in Math.

Higher levels of diversity, environment, friction and cliqueness in English classes may contribute to the perception of these classes in a stereotypical fashion, while the course content and objectives neither promote nor hinder student activity and learning.

The results of multiple regression with IQ partialled out show that the LEI scales generally have higher R's in the subtests corresponding to the English course content when perceptions were taken in English than in Math. However, for Math related subtests the partial R's are not consistently of differential magnitudes to permit an unequivocal conclusion on the differential validity of the LEI. There is no doubt, however, on the basis of the previous evidence (see Walberg, Singh, & Rasher, 1977), that student perceptions of the social environments of their classes account for substantial variance in cognitive, affective and behavioral learning criterion measures beyond that accounted for by corresponding beginning-of-course measures or mental abilities or both. The LEI variables do indeed have incremental predictive validity. In the present study, multiple R's of achievement measures with the LEI scales and IQ ranged from .55 to .80 and in almost all the achievement variables used, the environment variables added significantly to the prediction of the criterion.

The results of the present investigation are generally consistent with what has been found in previous studies involving perceptions of learning environments. However, the present investigation adds to the previous findings in that it shows that organizational differences of schools emerge through the perceptions of the psychosocial climate in a variety of academic activities and courses. It is reasonable to assume that differences in philosophical, religious, ethnic, and curriculum structure and emphasis do indeed have an impact on what academic and social activities students engage in and how different psychosocial interactions are valued.

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TABLE 1

Observed Means on the Main Effects for the 3 x 2 x 2 Incomplete Block Design on LEI Variables

LEI Variable	School			Subject		Sex	
	Girls' Parochial	Boys' Parochial	Coed. Public	Math	Eng.	Male	Female
1. Cohesiveness	19.15*	19.07	18.02	18.52	18.56	18.61	18.47
2. Diversity	20.85	20.91	21.16	20.68*	21.37	20.82*	21.25
3. Formality	18.38	18.57	18.45	18.59	18.34	18.69	18.22
4. Speed	17.37	18.19	18.09	19.04*	16.88	18.01	17.89
5. Environment	16.87*	17.92	18.55	17.53*	18.49	18.24	17.78
6. Friction	18.34*	19.69	17.92	17.78*	19.12	18.92	17.96
7. Goal Direction	18.68*	18.42	19.63	19.27	18.96	19.12	19.11
8. Favoritism	14.92*	15.85	13.51	14.27	14.56	14.49	14.34
9. Cliqueness	20.66*	20.34	19.64	19.65*	20.43	20.03	20.06
10. Satisfaction	17.46	16.59	17.45	16.91	17.55	16.95	17.55
11. Disorganization	15.65	16.27	15.33	15.61	15.67	15.64	15.64
12. Difficulty	18.93	19.31	19.64	20.46*	18.35	19.49	19.30
13. Apathy	15.21	17.01	16.14	16.27	16.04	16.54	15.74
14. Democratic	16.14	16.70	18.06	17.39	17.18	17.49	17.07
15. Competitiveness	16.62*	19.31	17.60	17.59	18.02	18.71*	16.84
N	71	80	166	157	160	165	152

* Significant at the .05 level.

TABLE 2

Observed Means on the Main Effects for the Two 2 x 2 Complete Block Designs on LEI Variables

LEI Variable	Girls' Data				Boys' Data			
	School		Subject		School		Subject	
	Parochial	Coed.	Math.	Eng.	Parochial	Coed.	Math.	Eng.
1. Cohesiveness	19.15*	17.86	18.34	18.59	19.07*	18.16	18.69	18.52
2. Diversity	20.85	21.60*	20.74	21.76*	20.91	20.73	20.62	21.01
3. Formality	18.38	18.07	18.36	18.08	18.57	18.80	18.81	18.57
4. Speed	17.37	18.36	19.37*	16.42	18.19	17.84	18.74*	17.30
5. Environment	16.87	18.57*	17.04	18.51*	17.92	18.53	17.99	18.48
6. Friction	18.34	17.63	17.34	18.58*	19.69*	18.20	18.20	19.62*
7. Goal Direction	18.68	19.49	19.16	19.07	18.42	19.76*	19.38	18.86
8. Favoritism	14.92*	13.83	14.21	14.46	15.85*	13.21	14.32	14.65
9. Cliqueness	20.66*	19.53	19.43	20.68*	20.34	19.74	19.85	20.20
10. Satisfaction	17.46	17.52	17.11	17.99	16.59	17.28	16.73	17.15
11. Disorganization	15.65	15.64	15.88	15.41	16.27*	15.04	15.35	15.92
12. Difficulty	18.93	19.62	20.66*	17.93	19.31	19.66	20.28*	18.73
13. Apathy	15.21	16.20*	15.83	15.54	17.01	16.09	16.69	16.39
14. Democratic	16.14	17.88*	17.12	17.01	16.70	18.24*	17.65	17.33
15. Competitiveness	16.62	17.02	16.34	17.33	19.31*	18.14	18.77	18.65
N	71	81	76	76	80	85	81	84

* Significant at the .05 level.

TABLE 3

Multiple R's of Cognitive Variables with the LEI Scales with and without IQ Partialled out of Cognitive Variables for Two Subject Specific Administrations of LEI

Cognitive Variable	R for Administration of LEI in			
	Math (N=157)		English (N=160)	
	IQ Not Partialled	IQ Partialled	IQ Not Partialled	IQ Partialled
Reading	.478	.204	.406	.205
Spelling	.336	.224	.437	.347
Capitalization and Punctuation	.424	.273	.480	.309
English Expression	.391	.145	.378	.219
Math Computation	.426	.225	.402	.199
Math Basic Concepts	.391	.250	.439	.284